Battermann
Geotechnical
Consulting
PLLC

October 30, 2013
Project No. 13053

Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report
Schoen Estates
NE 120th Street & Holmes Point Drive
Kirkland, Washington

Introduction

The purpose of this study was to gain subsurface information and perform geologic hazard reconnaissance to be utilized in the design and development of 6 single-family residence lots at the subject property. This report was prepared for the specific use of Mr. Fred Schoen and his agents. It is our understanding that the current property will be platted to six single family residence lots with an access road. The access road will extend east off of Holmes Point Drive in the NE 120th Street right-of-way across the north end of the western two lots and then turn south across the lot boundary between the west lots and the middle lots. The access road will the turn up the south side of the south middle lot before turning north to access the two eastern lots. A topographic survey and preliminary grading plan were provided for our use in this report by Civil Engineering Solutions.

Site Conditions

The trapezoidal shaped property extends about 395 feet east of Holmes Point Drive and about 145 feet south of the NE 120th Street right-of-way in Kirkland, Washington. The property has no current developments. There were single family residences located to the east and south with Denny Park to the north. The topography of the site slopes down to the west from a high point at the northeast corner. The majority of the property was at a fairly uniform grade of 22 percent with the upper east end being slightly less steep and the west strip between the property and Holmes Point Drive being more steep likely due to the road cut. Total elevation change was on the order of 86 feet between the northeast high point and Holmes Point Drive.

Vegetation consisted of second growth deciduous and conifer trees with a moderately thick understory of native ground cover plants from the natural local forest. The majority of the trees have been removed from the NE 120th Street right-of-way corridor as there were existing utilities installed along this alignment. No exposed ground, flowing, or standing water was observed on site.

Subsurface Conditions

Subsurface conditions on the property were inferred from visual reconnaissance of the property, a review of geologic maps of the area, and a series of 6 subsurface exploration pits excavated across the property. The exploration pits were excavated using a track-mounted backhoe. The exploration pits were logged by a geologist and immediately backfilled. The exploration pits were located in the

field based on visual reference from a tree survey. The approximate exploration pit locations are depicted on the Site and Exploration Plan attached to this report.

Exploration pit logs of the completed pits are attached to this report. The subsurface conditions consisted of a 12 to 18 inch layer of organic rich forest duff/topsoil overlying glacial deposits. The site soils were typically sand with some gravel overlying a glacial drift/till layer and sometimes with depth, over another sand and gravel unit. This is not entirely consistent with the geologic maps of the area. The King County map by Booth, Troost, and Wisher have the area mapped as Vashon Lodgement Till at the top of the slope with Vashon Advance Outwash over pre-Fraser fine grained deposits progressing down the slope. The older Kirkland Quadrangle map by Minard has the same progression but he called the pre-Fraser fine grained deposits transitional beds. None of our explorations encountered any fine grained deposits. Based on the density and the grain size distribution of the sediments encountered in our explorations compared with the identified mapping of the area, we are interpreting the upper sand and gravel to be a recessional deposit. A detailed description of the stratigraphy encountered is as follows.

Surface Soils

Two surface soil units from three soil series are identified in the USDA Soil Conservation Survey (SCS) – Soil Survey for King County, Washington (1973) for this area. The soil survey identifies the upper, eastern portion of the site as AgC-Alderwood gravelly sandy loam on 6 to 15 percent slopes. The remainder of the property is mapped as RdE-Ragnar-Indianola association on moderately steep slopes. BGC, pllc is in general agreement with the SCS mapped soil units although Alderwood soils were not encountered in our explorations but likely occur further east. Our interpretation would be that the entire site is best represented by the RdE soil series. Full descriptions of the soil series may be found in the above referenced document that is available online at: http://soildatamart.nrcs.usda.gov/Manuscripts/WA633/0/wa633_text.pdf.

The Ragnar soil series is a well-drained sandy loam formed on outwash terraces. Permeability is moderate to rapid in the surface layer and very rapid in the substratum. The erosion hazard is slight.

The Indianola loamy sand is typically excessively drained and formed atop sandy glacial outwash on broad uplands. The permeability is moderate to rapid and the available water capacity is low. Erosion potential to raindrop or sheet flow is low but increases to high to extreme under concentrated flow conditions.

Vashon Recessional Outwash

The upper sedimentary unit encountered in all of our explorations was Vashon Recessional Outwash. The recessional deposits consisted of loose to medium dense with depth (typically at 2.5 to 3 foot depth), dry to damp, light grey-brown, fine to coarse sand with some gravel. This sediment was deposited during the retreat of the Vashon ice sheet from fluvial processes off of the melting glacial ice sheet. The recessional outwash sand and gravel extended to depths of 4 to 9 feet in our explorations.

Vashon Lodgement Till

Vashon lodgement till sediments consist of a non-sorted mixture of silt, sand, and gravel deposited at the base of the ice sheet and was subsequently consolidated by several thousand feet of glacial ice. The till sediments consisted of dense, dry to damp, grey, silty, fine to medium sand with some gravel. The till sediments were encountered at a depth of 4 feet in EP-1 and extended beyond the

depth of the exploration at 7 feet, at a depth of 6 feet in EP-2 and was only 1 foot thick, was not encountered in EP-3 or EP-5, at a depth of 5 feet in EP-4 and was found to be 2 feet thick at this location, and at a depth of 6 feet in EP-6 and extended beyond the depth of the exploration at 8 feet.

Vashon Advance Outwash

Vashon advance outwash sand and gravel was encountered in EP-2, EP-4 and possibly could have formed the lower portion of EP-3. In both EP-2 and EP-4 the advance outwash sand were encountered at a depth of 7 feet and extended beyond the termination depth of 10 feet in both explorations. The outwash sand consisted of dense, damp, light brown, fine to medium sand with trace gravel. The advance outwash sand was deposited from fluvial processes during the advance of the Vashon ice sheet during the Fraser glaciation about 15,000 year ago.

Ground Water

Ground water was not encountered in any of the exploration pits at the time of our field study. Based on the permeable nature of the surficial sediments, the majority of surface runoff from the site likely infiltrates into the ground. In areas where lodgement till sediments were present, a portion of the infiltrated water likely flows across the top of the till surface as interflow, a perched ground water regime due to the low permeability till sediments. If the till sediments pinch out or where they are no-existent, the ground water will continue to infiltrate vertically into the advance outwash sand. As there was no evidence of ground water daylighting the slope, it is presumed that the majority of site runoff currently infiltrates into the subsurface sands. If perched interflow conditions occur, the amount of ground water seepage will vary with rainfall and season of the year. Ground water seepage is not anticipated to be an issue during the development of this project.

Geologic Hazards

The following discussion of potential geologic hazards is based on the visual reconnaissance of the site, the subsurface explorations, and reviews of aerial photographs and regional topographic maps of the area.

Landslide Hazard Geotechnical Evaluation

The subsurface exploration performed for this study revealed that the slope is underlain by medium dense and dense sand and gravel sediments with good drainage, and glacially consolidated, glacial till and advance outwash sand sediments with increasing depth. These sediments have good internal strength characteristics due to the past consolidation by several thousand feet of glacial ice. The relatively high internal shear strength and angle of friction of the glacial till and advance outwash sediments allow the natural formation of relatively steep slopes. The glacial till sediments are not typically prone to large, rotational failures.

During our geologic hazards reconnaissance of the site, the following were noted. The slope was well vegetated with large, straight, trees and abundant ground cover – there were no areas of exposed soils. There was no evidence of recent erosion due to either surficial water flow or the daylighting ground water seepages observed west of the planned development area. No evidence or indications of slope instability (tension cracks, hummocky ground, head scarp remnants) was observed on the slopes.

Based on our geologic hazards evaluation of the site, the condition of the existing topography whereby the existing slope gradient that is less than the internal angle of friction of the underlying slope sediments, and the free draining nature of the majority of the slope sediments, it is our opinion that the slopes onsite are considered to be stable and are not active landslide hazard areas. The slopes have formed due to natural geomorphic processes since the retreat of the Vashon ice sheet and we could find no evidence of subsequent slope movement.

It is our opinion that the development of the 6 estate lots will not have an adverse impact on the existing stability of the slope provided that the recommendations set forth in this report and on the approved civil plans are properly followed. No uncontrolled storm water discharges, either during or after the development, should be permitted to flow over the site slope. All fill soils placed on sloping ground steeper than 15 percent must be properly keyed and benched into the medium dense, native slope sediments to tie the fill into the slope.

Erosion Hazard

The onsite soils in the development area have a low to moderate erosion potential depending on the flow regime. The outwash sand and gravel will allow for the infiltration of the majority of "normal" storm events onsite during development. Erosion and sediment transport will be minimal under raindrop impact and sheet flow conditions. Under concentrated flow conditions with moderate to high flow velocities, the erosion and sediment transport is considered to be high. Runoff channels should be armored on slopes in excess of 7 % and flow control methods should be used to maintain low flow velocities. Concentrated flow routed across slopes steeper than about 7 % should be placed in a drain pipe rather than open channel to reduce the potential for erosion and sediment transport.

The proper use of "best management practices" BMPs should be used during development of the residences to minimize the potential for erosion and sediment transport. The following is a partial list of BMPs that should be implemented.

- Rock construction entrances
- Silt fences across the low sides of clearing areas
- Keeping all exposed soils covered when not actively worked
- Scheduling major earth work activities during dry conditions
- Establish temporary/permanent vegetation as soon as possible after foundation installation and utility hook-up.

With proper implementation of best management practices and common sense (i.e. don't start excavating the foundation in the middle a forecasted large rain event), the property may be developed without significant erosion or sediment transport.

Seismic Hazard

Generally, there are four types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture; 2) seismically induced landslides; 3) liquefaction; and 4) ground motion. The potential for each of these to impact the site is discussed below.

There was not a known fault zone within the vicinity of the project site. Fault zones in the Puget Sound region are currently being studied by the United States Geological Service (USGS) and have been determined to be active and capable of producing large earthquakes. Much is still to be learned about these fault systems but it is generally hypothesized that their recurrence interval is several thousand years. Due to the suspected long recurrence interval and the uncertainty of where the next

surface rupture may occur, the potential for surficial ground rupture is considered to be unpredictable and no mitigation is possible or necessary.

Based on the dense, consolidated nature of the glacial till and advance outwash sediments and their high internal strength characteristics, the risk of a deep seated, rotational landslide is considered to be low for the subject property in its current condition. Large scale grade changes could potentially have an impact on the current stability of the slope but we do not anticipate that large grade changes will be proposed for the planned development and the risk of a rotational failure will continue to be similar to the existing stability of the slope.

Based on the dense condition of the sediments encountered in our exploration pits and the lack of adverse ground water conditions, it is our opinion that the risk of liquefaction on this site is very low.

Seismic hazards that will affect the house will be due to the intensity and duration of the ground shaking. Based on the encountered stratigraphy, structural design of the project should be consistent with 2009 *International Building Code* (IBC) guidelines. In accordance with Table 1613.5.2 of the 2009 IBC, the subject site would be classified as Site Class C.

Geotechnical Engineering Recommendations

From a geotechnical engineering standpoint, the property is considered to be suitable for development of 6 single family residential lots. The bearing stratum is relatively shallow at a depth of 2 to 3 feet below current ground surface and medium dense outwash sand and gravel may be utilized for support of spread footing foundations for the residences, structural fills, and support for the access roadway/driveways. The outwash soils will be capable of supporting infiltration trenches to disperse storm water runoff from the residences back into the ground water regime but the access road should be routed to the existing storm water system. Plat development should follow the recommendations contained within this report and City of Kirkland development standards.

Site Preparation

The existing vegetation and upper 1 to 1.5 feet of organic rich topsoil should be removed from all road, driveway and foundation areas. These materials are not suitable for use in structural fills and any excess material that will not be part of future landscaping plans should be removed from the site. Topsoil that will be re-used on site should be stockpiled away from structural developments and should be protected from erosion with plastic sheeting.

Erosion control measures applicable to the time of year and appropriate to the type of construction activity should be installed prior to earth disturbing activities. Provisions should be made to route upslope drainage runoff from around the planned work areas either with temporary swales or with permanent cutoff drains.

Temporary cut slopes for foundation excavations or rockeries in the medium dense, recessional outwash sand sediments should be capable of supporting 1H:1V slope inclinations during construction, depending on the height of the cuts planned. Temporary cuts to install utility lines using trench box, shoring techniques should remain stable to allow the installation of the trench box. Permanent cut or structural fill slopes should be limited to a maximum inclination of 2H:1V. Fill slopes in non-structural fill areas should be limited to 3H:1V

Structural Fill

Grading plans for the project have not been finalized at the time of this report. There is the potential that structural fills may be used for construction of the access road, driveways, and may be desired to be placed for support of one or more of the planned residences. Any fill soil to be placed in roadway, driveway areas, or under structures should be placed and compacted in accordance with the recommendations contained in this section of the report.

All organic soil should be removed from areas to receive structural fill. Loose surface soil disturbed due to the stripping process should be compacted to a firm non-yielding condition prior to placing structural fill. The prepared subgrade should be verified that it ready to receive structural fill by the geotechnical engineer. Non-organic fill soil should be placed in thin lifts, not to exceed 10 inches, on horizontal planes. Filling lifts on non-horizontal planes should be avoided. All fills to be placed on greater than 15 percent slopes must have level benches cut into the slope prior to placing the fill. The toe of these fills should be keyed a minimum of 2 feet below the surrounding grade. Each lift of fill should be compacted to a minimum of 95 percent of the modified Proctor maximum dry density per ASTM:D-1557. The structural fill pad should extend a minimum of three feet beyond the edge of a structure or driveway before sloping to match the existing grades.

Placement and compaction of the structural fill should be monitored by a competent field technician. In situ density testing should be performed to verify proper compaction of the fill soil.

Foundations

Spread footing foundations may be used for foundation support of the planned single family residences when founded on medium dense outwash sand, glacial till sediments, or on approved structural fill soil place as previously described. An allowable foundation bearing capacity of 2000 pounds per square foot may be used for spread footings set to bear on these bearing strata. A short term increase of one-third may be used for wind, snow, or seismic loads. Additional bearing capacity for support of larger loads such as retaining walls or other, non-conventional structures is available but would require additional foundation embedment. BGC, PLLC should be contacted to provide appropriate geotechnical engineering for such structures. Steps in the spread footing foundation grades are acceptable provided that none of the foundations are set to bear adjacent to a vertical step. A 1H:1V load line extending down from the edge of the foundation must not daylight a cut slope. Anticipated settlement of the foundation when properly set to bear on an approved bearing stratum will be less than 1 inch. BGC, PLLC should perform a foundation soil bearing evaluation prior to placing foundation concrete to verify that the prepared footing subgrade complies with the recommendations in this report.

Lateral loads can be resisted by friction between the foundation and the supporting soils, and/or by passive earth pressure acting on the buried portions of the foundations. The foundations must be backfilled with structural fill compacted to a dense, non-yielding condition to achieve the passive resistance provided below. The structural fill must extend horizontally outward from the embedded portion of the foundation a distance equal to at least three times the embedment depth over which the passive resistance is applied. We recommend the following design parameters.

- Passive equivalent fluid = 250 pcf
- Coefficient of friction = 0.35

The above values are allowable and include a factor of safety of at least 1.5.

Retaining Walls and Lateral Earth Pressures

It is likely that the east foundation wall of the planned residences will also be a retaining wall. The concrete foundation walls that are free to yield laterally at least 0.1 percent of their height at the top may be designed for "active" lateral earth pressure equivalent to 30 pounds per cubic foot (pcf). Retaining walls that are fixed at the top and not free to yield laterally should be designed to resist "at-rest" soil pressure conditions using an equivalent fluid pressure of 50 pcf. The foundation walls should use either select onsite, clean, sand and gravel or approved drainage boards against the wall to prevent the build-up of hydrostatic pressure on the wall. Clean backfill is defined as material having less than 5 percent fines when measured on the minus ¼ inch sieve portion of a grain size distribution. The upper two feet of wall backfill should be backfilled with a low permeability soil to discourage surface runoff from entering the wall drainage system. Approved drainage boards, such as Inca Mat or Mira Drain, should be placed to extend from approximately two feet below the top of the wall down to hydraulically tie into the footing drain system. Backfill of the foundation walls outside should be placed in approximate 12 inch loose lifts and compacted to a medium dense condition around 90 percent of the modified Proctor maximum dry density. A higher degree of compaction is not recommended as this may increase the pressures acting on the basement walls.

Floor Support

Conventional new home construction utilizes crawlspace type floors in the living areas of the home and slab-on-grade floors for the garage and possibly daylight basements. Based on past experience in the Puget Sound region, we strongly suggest that the crawlspace area be backfilled above the footing and be sloped to drain. The crawlspace may be graded to a low that may be connected to the foundation drain or daylight in the yard. The interior foundation soils should be covered with a moisture barrier and the crawlspace area should be well ventilated to reduce the potential for moisture damage.

Slab-on-grade concrete floors should be cast atop a prepared subgrade. The subgrade soils should be compacted to a minimum of 90 percent of the modified Proctor maximum dry density or be firm, non-yielding native sediments. The floor slab should be cast atop a capillary break consisting of a minimum of 4 inches of pea gravel or clean crushed rock with less than 5 percent fines (material passing the No.200 sieve). The capillary break will reduce the potential for moisture from wicking through the floor slab. A plastic sheeting vapor barrier should also be placed atop the capillary break material. All concrete placements should follow the guidelines set forth by the American Concrete Institute (ACI).

Drainage Considerations

A perimeter foundation drain should be established to protect the foundation/crawlspace from ground water intrusion. The level of the foundation drain should be set at, or slightly below, the base of the footing elevation. The drain should consist of 4 inch diameter, rigid, perforated, PVC drain pipe and should be set to allow for gravity discharge. The drain pipe should be surrounded by a minimum of 6 inches of pea gravel or washed drain rock. Roof drains should not tie into the footing drain but should be collected in a separate, tightline drain. Any potential retaining walls planned for the project should have a full height chimney drain established behind the back of the wall to prevent the build-up of hydrostatic pressures.

Rockery Recommendations

Rockeries are considered to be long-term erosion protection of stable cut slopes with minor retention as a gravity wall. Rockeries may be placed against structural fill slopes but the fill body should be constructed as a mechanically stabilized earth (MSE) fill using geogrid reinforcement. All rockeries to be set against fill soils in excess of three feet tall should be constructed as MSE rockeries. Quality rockeries with a good finish appearance and minimal long term maintenance requires a competent contractor with rockery experience. We recommend that all rockeries be constructed by an experienced rockery contractor.

The base of the rockery should be set to bear on medium dense, undisturbed soil or approved structural fill excavated in a trench a minimum of 12 inches below finish grade. The base rocks should be a minimum of 3 to 4 man sized rocks. The remaining rockery rows should consist of minimum 3 man rock up to the top two feet where the smaller 2 and 1 man rocks may be used to create an aesthetically smooth top surface of the rock wall. Each rock shall be set to bear on the two rocks below it – vertical stacking of rocks is to be avoided. The void space between the back of the rocks and the dense cut slope must be backfilled with 2 inch diameter quarry spall crushed rock (railroad ballast) and not with soil. The rockery rocks shall be set to minimize the void space between the rocks. The rockery shall be constructed to have a minimum 1H:8V (horizontal:vertical) batter from vertical back into the slope.

MSE rockeries shall be constructed as described above but the zone of fill soil equal to the height of the rockery behind the rockery shall be constructed as mechanically stabilized earth. The fill in this area must be compacted to a minimum of 95 percent of the modified Proctor maximum dry density. The fill body must also contain layers of Synteen 30, Mirafi 3XT, or approved equivalent, geogrid set horizontally behind the back of the rockery at a vertical spacing of every 18 inches throughout the height of the backfill.

There is no need to construct a drain behind the rockery due to the free draining sand and gravel surficial soils onsite. There is a low potential for ground water seepage to discharge from the cut slopes. Potential water that does seep from the cut slope or drain from surface runoff will seep out onto the gravel area from the voids between the rocks. There is no way to build-up hydrostatic pressure behind the rockery that would add to the lateral earth pressure acting on the rockery.

Conclusion

Based on our site reconnaissance and subsurface explorations the site appears to be suitable for the proposed development provided the recommendations presented herein are properly implemented. The proposed development will not decrease the existing slope stability on the subject property or on adjacent properties and the newly created building sites will be stable under normal geologic conditions.

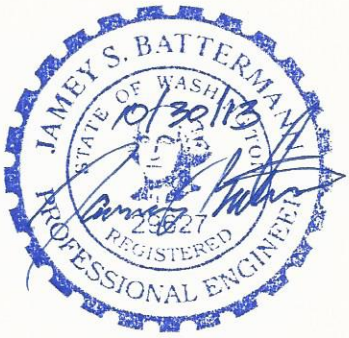
We recommend that we be retained to review those portions of the plans and specifications that pertain to grading or foundation installations to determine that they are consistent with the recommendations of this report. Construction monitoring and consultation services should also be provided to verify that subsurface conditions are as expected. Should conditions be revealed during construction that differs from the anticipated subsurface profile, we will evaluate those conditions and provide alternative recommendations where appropriate.

Field construction monitoring and observation services should be considered an extension of this initial geotechnical evaluation, and are essential to the determination of compliance with the project drawings and specifications. Such activities would include site clearing and grading, subsurface drainage, foundation soil bearing evaluations, rockery construction and fill placement and compaction.

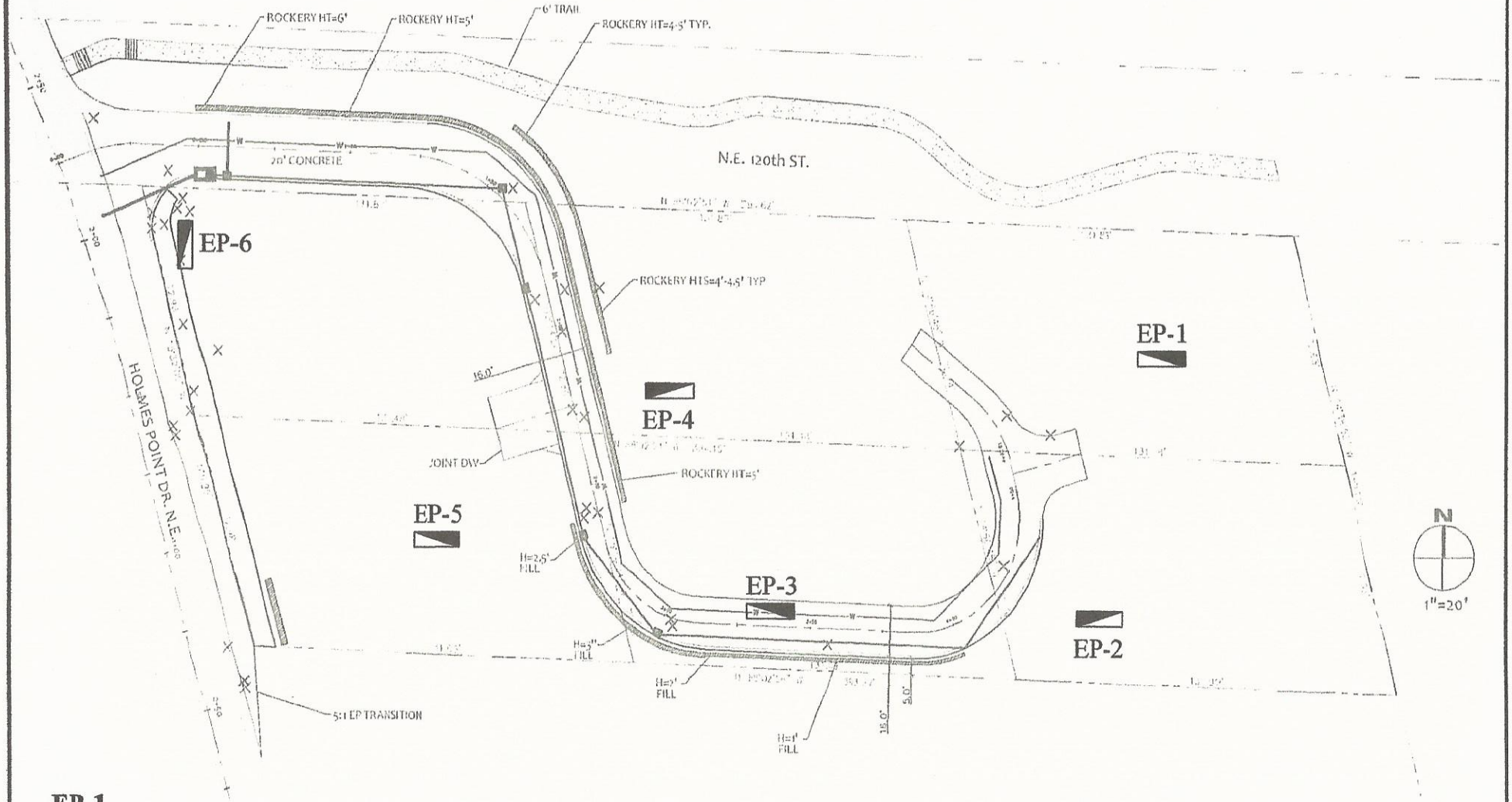
Our findings and recommendations provided in this report were prepared in accordance with generally accepted principles of engineering geology and geotechnical engineering as practiced in the Puget Sound area at the time this report was submitted. We make no other warranty, either express or implied.

We are available to provide additional geotechnical engineering design and consultation throughout the development of this project. We have enjoyed working with you on this project. If there are any questions, please contact us at 425 273-5062.

Sincerely
Battermann Geotechnical Consulting, PLLC
Jamey S. Battermann, P.E.



Attachments: Site and Exploration Plan
Exploration Pit Logs



EP-1 Approximate locations of exploration pits

Base map provided by Civil Engineering Solutions

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Site and Exploration Plan

Schoen Estates
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Figure 1	Project No: 13053	October 30, 2013

EXPLORATION PIT LOG

Number EP-1

0 – 1	**Topsoil** Loose, dry, brown, fine to medium sand with roots.
2 – 4	**Vashon Recessional Outwash, Qvr** Loose to medium dense, dry, light grey-brown, fine to coarse sand with some gravel and occasional cobbles.
4 – 7	**Vashon Lodgement Till, Qvt** Dense to very dense with depth, damp, grey, silty fine to medium sand with trace to some gravel.
7 – 13	BOH @ 7' No ground water seepage No caving or sloughing

Subsurface conditions depicted represent our observation at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis and judgment. We will not accept responsibility for the use or interpretation by others of information presented on this log.

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EXPLORATION PIT LOG

Number EP-2

0

Topsoil

Loose, dry, brown, fine to medium sand with roots.

1

Vashon Recessional Outwash, Qvr

2 Loose, dry, light grey-brown, fine to coarse sand with some gravel.

Medium dense, damp, light grey-brown, fine to coarse sand with some gravel.

3

4

5

6

Vashon Lodgement Till, Qvt

Dense, dry, light grey, silty fine to medium sand with trace gravel.

7

Vashon Advance Outwash, Qva

Dense, damp, light brown with orange oxidation, fine to medium sand

8

9

10

BOH @ 10'
No ground water seepage
No caving or sloughing

11

12

13

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EXPLORATION PIT LOG

Number EP-3

0

Topsoil

Loose, dry, dark brown, loamy fine to medium sand with roots.

1

Vashon Recessional Outwash, Qvr

Loose, dry, light grey-brown, fine to coarse sand with some gravel.

2

3

Medium dense, damp, light grey-brown, fine to coarse sand with some gravel and trace silt.

4

5

6

7

8

9

BOH @ 9'
No ground water seepage
Minor sloughing upper 3'

10

11

12

13

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EXPLORATION PIT LOG

Number EP-4

0 – 1	**Topsoil** Loose, dry, brown, fine to medium sand with roots.
1 – 5	**Vashon Recessional Outwash, Qvr** Loose, dry, light grey-brown, fine to medium sand with some gravel. Medium dense, damp, light grey-brown, fine to coarse sand with some gravel.
5 – 7	**Vashon Lodgement Till, Qvt** Dense, damp, grey, silty fine to medium sand with trace gravel.
7 – 10	**Vashon Advance Outwash, Qva** Dense, damp, light brown-grey, fine to medium sand with trace gravel.
10 – 13	BOH @ 10' No ground water seepage No caving or sloughing

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EXPLORATION PIT LOG

Number EP-5

0

Topsoil

Loose, dry, brown, fine to medium sand with roots.

1

Vashon Recessional Outwash, Qvr

2

Loose, dry, light grey-brown, fine to medium sand with some gravel.

3

Medium dense, damp, light grey-brown, fine to coarse sand with some gravel.

4

5

6

7

8

9

Vashon Lodgement Till, Qvt

Dense, damp, grey, silty fine to medium sand with trace gravel.

10

BOH @ 10'
No ground water seepage
No caving or sloughing

11

12

13

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EXPLORATION PIT LOG

Number EP-6

0 – 1	**Topsoil** Loose, dry, brown, fine to medium sand with roots.
1 – 6	**Vashon Recessional Outwash, Qvr** Medium dense, damp, grey-brown, gravely fine to coarse sand.
6 – 8	**Vashon Lodgement Till, Qvt** Dense, damp, grey, silty fine to medium sand with trace gravel.
8 – 13	BOH @ 8' No ground water seepage No caving or sloughing

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APPENDIX E-EROSION CONTROL NARRATIVE

EROSION CONTROL NARRATIVE

PROJECT DESCRIPTION
INSTALL ROAD AND UTILITIES TO SERVE EXISTING 6-LOT PARCELS PREVIOUSLY SUBDIVIDED VIA TESTAMENTARY. SITE PROXIMITY ALLOWS FOR EXEMPTION FOR STORMWATER FLOW CONTROL (IE DETENTION) ASSUMING STORM SYSTEM HAS CAPACITY.

EST. TOTAL DISTURBED AREA:
0.6 ACRES

GROSS SITE AREA:
1.26 ACRES

SITE DESCRIPTION:
UNDEVELOPED PARCELS OFF HOLMES POINT DRIVE NE NEAR LAKE WASHINGTON. AVERAGE SITE SLOPE ABOUT 23%. SANDY RECESSIONAL OUTWASH SOILS PER 6 BORING INVESTIGATION BY BATTERMANN CONSULTING. NO GROUND WATER ENCOUNTERED. HOLMES POINT DRIVE WILL BE WIDENED. ROCKERIES REQUIRED. NEW 16 TO 20-FOOT WIDE DRIVE INTO SITE REQUIRING ROCKERIES TO MINIMIZE SLOPES AND GRADING.

GEOTECH REPORT
SEE REPORT BY BATTERMANN CONSULTING, FALL 2013.

EROSION CONTROL DISCUSSION
SEE TESC PLANS PREPARED BY CES. SOIL TYPE HAS LOW EROSION POTENTIAL DUE TO HIGH INFILTRATION CAPACITY. LAND DISTURBING ACTIVITIES LIKELY WILL ONLY OCCUR DURING NON-RAINY SEASON. STANDARD EROSION CONTROL MEASURES ARE SHOWN ON C1.0 INCLUDING CONSTRUCTION ENTRANCE, STRAW WADDLES, SILT FENCE, INLET PROTECTION, AND SEEDING.